STREET SWEEPER

CROSS REFERENCES TO RELATED APPLICATIONS

[0001] None.

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0002] The present invention is for a street cleaning device, and, more particularly, pertains to a street sweeper with vacuumized dust control.

DESCRIPTION OF THE PRIOR ART

[0003] Prior art street sweeper devices are often built on and about custom chassis not generally suited for economy of speed or having attributes geared toward desirable roadability qualities. Often such street sweepers include rotary sweeper brooms placed between the front wheel assemblies and special rear wheel drive or axle assemblies beneath a configured framework in an area often otherwise reserved for drive shafts and other framework members in conventional chassis, such as used for conventional trucks. Street sweepers utilizing truck chassis are also used for mounting of street sweeper components and are utilized for greater roadability and transport speed suitable for highway use. Some arrangements, such as rotary broom placement between the front wheel and rear wheel assemblies, are often limited, necessitating the use of smaller rotary brooms the dimensions of which are restricted by the available distance between the roadway and the chassis of the conventional truck. In the alternative, rotary sweeper brooms of larger size and better suitability can be located behind the rear axle at the rear portion of the truck chassis, as the upper

region of the rotary broom is not generally limited by the chassis. Commonly, water is utilized to attempt to control dust in either configuration around and about the general area surrounding the street sweeper. The use of water is not always economical, water may not be readily available for dust control, large water flow may be required for effective dust control, thereby necessitating frequent refilling stops due to limited tank capacity, and the use of water at higher speeds may not be effective. Clearly, what is needed is a street sweeper having a method of road sweeper dust control which is not entirely dependent on the use of water and which can utilize a rotary broom located to the rearward of the rear street sweeper axle, such as is provided by the present invention.

SUMMARY OF THE INVENTION

[0004] The general purpose of the present invention is to provide a street sweeper with vacuumized dust control.

[0005] According to one embodiment of the present invention, there is provided a street sweeper with vacuumized dust control which mounts and secures to a chassis of a truck. A hopper, a conveyor mechanism, a conveyor housing, a rotary broom and a vacuumized chamber are arranged and mounted to the chassis of the truck. The rotary broom is located at the rear portion of the truck chassis adjacent to the lower end of the conveyor and conveyor housing and rearward of the rear street sweeper axle. Also located at, about and near the lower end of the conveyor and conveyor housing is a rotary broom shroud forming a rotary broom chamber capable of being vacuumized which surrounds the greater portion of the rotary broom. Components comprising the bottom edge of the rotary broom chamber and other components are in close proximity to and in intimate contact with the roadway. The upper end of the conveyor mechanism and the surrounding upper end of the conveyor housing sealingly connect to the upper region of the hopper. The hopper includes a fan air source and a filter for filtration of dust drawn into the hopper through the conveyor housing and for filtration of dust created by objects being deposited into the confines of and striking the sides or lower regions of the hopper. The fan is ducted to the rotary broom chamber by the interceding and sealingly connected conveyor housing. Rotary action of the fan creates a low pressure area or vacuum within the confines of the hopper which is ducted through the conveyor housing to provide an extended region of low pressure at the rotary broom chamber located about the rotary broom. Dust and other airborne materials of light

weight which are dislodged or made to be airborne by action of the rotary broom are vacuumed and transferred by vacuum forces into the interior of the hopper where the airflow containing the dust is forced through the filter and where the lightweight materials either fall to the lower regions of the hopper or are made to come into contact with the filter. Airflow created by the fan also assists in urging lightweight debris, such as leaves, small paper items, and the like onto the conveyor for deposition in the hopper. Some dust or debris when not under the influence of vacuum air can be deposited on the conveyor by direct action of the rotary broom for subsequent deposition in the hopper. Heavier swept debris is deposited on the conveyor in a conventional manner and deposited into the hopper. Additionally, a transversely mounted water tank is also included for conventional use or for use in combination for dust control with the vacuum function if desired.

[0006] One significant aspect and feature of the present invention is a street sweeper with vacuumized dust control.

[0007] Another significant aspect and feature of the present invention is a street sweeper including components for vacuumized dust control which mounts on a truck chassis.

[0008] Still another significant aspect and feature of the present invention is a street sweeper which transports to sweeping locations at common highway speeds.

[0009] Another significant aspect and feature of the present invention is a rotary broom and rotary broom chamber located to the rearward of the street sweeper rear axle.

[0010] Yet another significant aspect and feature of the present invention is a street sweeper having a conveyor mechanism and a conveyor housing surrounding the conveyor mechanism.

[0011] A further significant aspect and feature of the present invention is a street sweeper where the conveyor housing sealingly aligns to a hopper receiver duct on the upper region of a hopper.

[0012] A still further significant aspect and feature of the present invention is a street sweeper where the conveyor housing aligns with and communicates with a rotary broom chamber surrounding a rotary broom.

[0013] A still further significant aspect and feature of the present invention is a street sweeper where a rotary broom chamber surrounding a rotary broom is in close proximity to and/or in intimate contact with the roadway.

[0014] Yet another significant aspect and feature of the present invention is a street sweeper having a rotary broom chamber including road following skids and attached positionable planar side plates.

[0015] A still further significant aspect and feature of the present invention is a street sweeper where an area of low pressure is presented around and about the area of contact of a rotary broom with the roadway whereby dislodged road dust and other light debris is carried by vacuum forces via a conveyor housing to a hopper for filtration.

[0016] A still further significant aspect and feature of the present invention is a rotary broom rotating against the path of intended sweeping to forwardly and upwardly project dirt and debris into the lower end of a conveyor mechanism for transport of the dirt and debris along the conveyor mechanism for subsequent deposit in a hopper.

[0017] Having thus described embodiments of the present invention and enumerated several significant aspects and features thereof, it is the principal object of the present invention to provide a street sweeper which features, in part, vacuumized dust control.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Other objects of the present invention and many of the attendant advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, in which like reference numerals designate like parts throughout the figures thereof and wherein:

[0019] **FIG. 1** illustrates a cutaway overview of a street sweeper, the present invention, which has vacuumized dust control;

[0020] **FIGS. 2 and 3** illustrate, in partial cutaway, opposing side views of the street sweeper;

[0021] **FIGS. 4 and 5** illustrate, in partial cutaway, opposing side views of the street sweeper where the pivotal broom support arms, the pivotal drag shoe support arms, the drag shoes, the plates, the cables, and the outer coverings of the support structures have been removed to reveal, in part, other components comprising the rotary chamber;

[0022] **FIGS. 6 and 7** illustrate, in partial cutaway, opposing side views of the street sweeper where additional components including flexible side panels, fixed non-flexible panels, and non-flexible panels have been removed to reveal, in part, other components comprising the rotary broom chamber;

[0023] **FIG. 8** illustrates an isometric view of the conveyor housing and other components associated therewith;

[0024] **FIG. 9** illustrates the deflection mode, whereby the lower region of the conveyor housing encounters an obstacle while primarily engaged in the sweep mode;

[0025] **FIG. 10** illustrates the transit mode, whereby the conveyor housing is raised to allow high speed transit of

the street sweeper along the roadway to a sweeping site; and,

[0026] **FIG. 11** illustrates the dump mode, whereby the conveyor housing is raised and positioned rearwardly to accommodate removal of debris and subsequent depositing of the debris to an adjacently positioned truck from an elevated hopper.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0027] **FIG. 1** illustrates a cutaway overview of the street sweeper 10, the present invention, which has vacuumized duct control. Major and other components complementary to the invention are mounted to and secured to the frame or chassis 13 of a truck 12 or are mounted elsewhere at other locations about the invention. Major illustrated components of the invention include a hopper 14, a conveyor mechanism 16, a conveyor housing 18, a rotary broom 20 and a rotary broom chamber 22 which are arranged and mounted to the chassis 13 of the truck 12 or other frameworks in a position rearward of the street sweeper rear axle 17. Rearwardly extending frameworks 21 and 21a (**FIG. 3**) mount and secure to the chassis 13 of the truck 12 to accommodate a portion of the components of the invention. A superstructure framework 23 including a plurality of framework members 23a-23n is shown partially and generally in dashed lines extending upwardly and forwardly from the frameworks 21 and 21a to serve as structure for mounting of fixed panels or access panels or other devices as required.

[0028] The hopper 14 secures to the truck chassis 13 via a scissors jack assembly 24 which mounts to the truck chassis 13 via a scissors jack mounting frame 25. An air source consisting of a powered fan 26 having an exhaust port 28 and which is open to and which communicates through a filter 30 with the interior of the hopper 14 is attached to a hopper top panel 32. A plenum 34, also shown in **FIG. 2**, is located at the upper region of the hopper 14 and houses and partially supports the filter 30. The top of the filter 30 aligns substantially to the bottom surface of the hopper top panel 32 and to the bottom of the fan 26. The bottom of the filter 30 faces the interior of and communicates with the

interior of the hopper 14. A receiver duct 36 mounts to the hopper top panel 32 to communicate with the interior of the hopper 14 and to sealingly connect with the elevated end of conveyor housing 18 surrounding the conveyor mechanism 16. A flexible seal 38 and opposing flexible side seals 39 and 39a and other seals located at the upper end of the conveyor housing 18 seal against components located at the inlet of the receiver duct 36, as shown in **FIG. 2**. An angled channel 42 is located in the vertically oriented hopper rear panel 44 for accommodation of the upper end of the conveyor mechanism 16. A hopper dump door 46 for emptying of the hopper 14 is located on the outwardly facing and vertically oriented hopper side panel 50 of the hopper 14.

[0029] The conveyor housing 18 and the conveyor mechanism 16, which is powered, are co-located, with the conveyor mechanism 16 being surrounded by the conveyor housing 18. An upper powered conveyor drive roller 52 mounts transversely across the upper region of the conveyor housing 18, and a lower powered conveyor drive roller 54 mounts transversely across the lower region of the conveyor housing 18. The conveyor mechanism 16 utilizes a cleated belt 56 or other suitable device to move debris deposited thereupon by action of the rotary broom 20, which rotates against the sweeping path into the confines of the hopper 14. The upper end of the conveyor mechanism 16 aligns to and extends along, through and beyond the angled channel 42 of the hopper rear panel 44 in order that debris can be off-loaded from the conveyor into the hopper 14. The lower end of the conveyor mechanism 16 extends downwardly and outwardly from the lower region of the conveyor housing 18 to juxtapose the rotary broom 20. The conveyor housing 18 extends for the most along and surrounds the upper portion of

the conveyor mechanism 16 but terminates short of the lower end of the conveyor mechanism 16, thereby exposing the cleated belt 56 within the rotary broom chamber 22 to allow debris to be loaded on the cleated belt 56. The conveyor housing 18 and contained conveyor mechanism 16 are positionable according to the mode of operation of the invention. A transversely mounted geometrically configured water tank 58 (partially shown) extending over the top of the conveyor mechanism 16 and conveyor housing 18 is included to provide for a water supply which may be connected to spray nozzles located appropriately about the truck chassis or other desired regions if the use of water is desired. The rotary broom 20 is supported at opposing ends by like and opposing pivotal broom support arms 60 and 60a (**FIG. 3**). The drag shoe 62 and the opposing drag shoe 62a (**FIG. 3**) are supported by like and opposing pivotal drag shoe support arms 64 and 64a (**FIG. 3**). Support structures 67 and 67a (**FIG. 3**) extend downwardly from the chassis 13 to provide for pivotal support of the like and opposing pivotal broom support arms 60 and 60a and rotary broom 20 and for pivotal support of the like and opposing pivotal drag shoe support arms 64 and 64a and opposing drag shoes 62 and 62a, respectively. Optional gutter broom assemblies 65 and 65a (**FIG. 3**), including an optional surrounding structure, are mounted to the chassis 13 of the truck 12 and are shown without the surrounding structure when shown in the figures that follow.

[0030] **FIGS. 2 and 3** illustrate, in partial cutaway, opposing side views of the street sweeper 10. In these views, the conveyor housing 18 containing the conveyor mechanism 16 is positioned in the sweep mode to best show the relationship of the upper region of the conveyor housing 18 and contained conveyor mechanism 16 with the upper and rearward region of the hopper 14. Other normal operating positions of the conveyor housing 18 and contained conveyor mechanism 16 are shown and described later in detail. In the illustrations and descriptions that follow, it is to be understood that the contained conveyor mechanism 16 is located for the most within the conveyor housing 18 and that the positioning of the conveyor housing 18 also includes the similar positioning of the contained conveyor mechanism 16 located therein.

[0031] Frameworks 21 and 21a mount to the chassis 13 of the truck 12 via a mounting structure 66 mounted transversely to the chassis 13. Frameworks 21 and 21a extend rearwardly and then downwardly to terminate near the rearward and outward edges of the rotary broom 20. A rear bumper 68 extends, as do other structural members, transversely between the ends of the framework 21 and the opposing corresponding framework 21a. Framework 70 in the form of a box tube or other suitable structure secures in longitudinal orientation to and along the inner surface of the framework 21 and to other members as required, as does another opposing framework 70a to the inner surface of the framework 21a. Opposing frameworks 70 and 70a are for the most incorporated for support of the conveyor housing 18, as later described in detail. A forward axle 15 and a rear axle 17 mount to the chassis 13 of the truck 12.

[0032] Opposing pivotal broom support arms 60

and 60a and opposing pivotal drag shoe support arms 64 and 64a, respectively, are positionally pivoted by opposed sets of lifting/lowering cylinders, bell cranks and cables to position the rotary broom 20 and opposing drag shoes 62 and 62a, respectively. Respectively, broom lift/lower cylinders 72 and 72a attach separately to bell cranks 74 and 74a, and cables 76 and 76a attach between bell cranks 74 and 74a and the pivotal broom support arms 60 and 60a to control the vertical position of the rotary broom 20. Respectively, drag shoe lift/lower cylinders 78 and 78a attach separately to bell cranks 80 and 80a, and cables 82 and 82a attach between bell cranks 80 and 80a and the pivotal drag shoe support arms 64 and 64a to control the vertical position of the drag shoes 62 and 62a. Drag shoes 62 and 62a in part comprise the rotary broom chamber 22 in concert with other components described herein. A bracket 69 on one end of the pivotal broom support arm 60 supports one end of the rotary broom 20. The opposing end of the rotary broom 20 is supported by a hydraulic drive motor assembly 61 (**FIG. 3**) which powers the rotary broom 20. Geometrically configured and substantially vertically oriented plates 63 and 63a mount to the trailing portions of the drag shoes 62 and 62a, respectively. Plates 63 and 63a serve as guides or stops for flexible side panels 94 and 94a shown in **FIGS. 4 and 5**.

[0033] Additionally shown in **FIGS. 2 and 3** are conveyor/conveyor housing mount assemblies 84 and 84a, conveyor belt tensioner assemblies 86 and 86a, and a hydraulic fluid tank 88, which are described later in detail. Also shown in the views is the water tank 58 which mounts transversely across the frameworks 70 and 70a. The water tank 58 includes access holes 59 and 59a extending through the right and left sides, respectively, for access to

conveyor belt tensioner assemblies 86 and 86a shown in **FIGS. 2, 3, 4 and 5**. A filter shaker mechanism 31 is mounted in the hopper 14 to communicate with and actuate the bottom of the filter 30 to clean the filter 30 when the filter 30 is blocked to such a degree that not enough air is passing through the filter 30 for filtration.

[0034] **FIGS. 4 and 5** illustrate, in partial cutaway, opposing side views of the street sweeper 10 where the pivotal broom support arms 60 and 60a, the pivotal drag shoe support arms 64 and 64a, the drag shoes 62 and 62a, the plates 63 and 63a, the cables 76, 76a, 82 and 82a, and the outer coverings of the support structures 67 and 67a have been removed to reveal, in part, other components comprising components of a shroud 27 which form rotary broom chamber 22. In **FIG. 4** the right side of the configured water tank 58 is not shown in order to reveal components of and associated with the mounting of the conveyor housing 18; and in **FIG. 5** the left side of the configured water tank 58 is not shown. Additional components, comprising, in part, the shroud 27 forming the rotary broom chamber 22, include corresponding opposed vertically oriented panels located generally adjacent to the opposing ends of the rotary broom 20, are clearly shown. Opposing vertically oriented fixed non-flexible panels 90 and 90a having slots 92 and 92a, respectively, being a portion of the shroud 27, secure to and extend from the frameworks 21 and 21a. Opposing vertically oriented flexible side panels 94 and 94a of the shroud 27 secure to and extend downwardly from the rear and lower edge of the fixed non-flexible panels 90 and 90a of the shroud 27. Opposing vertically oriented non-flexible panels 96 and 96a, which attach to and move with the upper region of the drag shoes 62 and 62a, respectively (**FIGS. 2 and 3**), align partially behind and with near juxtaposition with the fixed non-flexible panels 90 and 90a to form, in part, shroud 27. Vertically oriented non-flexible panels 98 and 98a, part of shroud 27, secure to the upper and rear region of and move with the pivotal broom support arms 60 and 60a (**FIGS. 2 and 3**) to transitionally cover the greater region of the

slots 92 and 92a in fixed non-flexible panels 90 and 90a. Additional components, comprising, in part, the shroud 27 which forms the rotary broom chamber 22, include transversely mounted fixed panels 100a, 100b and 100c, shown in dashed lines, extending between the frameworks 21 and 21a. A vertically oriented transversely mounted fixed panel 104 extends downwardly from the frameworks 21 and 21a to comprise in part the support structure 67 and 67a. In addition and as part of the shroud 27, vertically oriented transversely mounted flexible panels 106 and 108 extend downwardly from the fixed panel 100c and in transversal mounting between the lower regions of the frameworks 21 and 21a to comprise in part the shroud 27 forming the rotary broom chamber 22.

[0035] **FIGS. 6 and 7** illustrate, in partial cutaway, opposing side views of street sweeper 10 where additional components including flexible side panels 94 and 94a, fixed non-flexible panels 90 and 90a, non-flexible panels 96 and 96a, and non-flexible panels 98 and 98a have been removed to reveal, in part, other components comprising the shroud 27 forming the rotary broom chamber 22. Also shown in the views are additional seal members and components incorporated to mount and/or suspend the conveyor housing 18 and contained conveyor mechanism 16.

[0036] A large transversely extending flexible seal 110 of suitable rubber, plastic or the like comprises, in part, the shroud 27 forming the rotary broom chamber 22. The forward edge 112 of the flexible seal 110 secures in transverse fashion to the lower portion of the conveyor housing 18, and the rearward edge 114 secures in transverse fashion to the underside of the fixed panel 100a, thereby utilizing the rear portion of the fixed panel 100a to comprise, in part, the shroud 27 forming the rotary broom chamber 22. The large flexible seal 110 also includes outwardly facing edges 116 and 116a which align interfacingly and in perpendicular fashion in close proximity or having intimate contact with the non-flexible panels 96, 96a, 90 and 90a, respectively, to comprise, in part, the shroud 27 forming the rotary broom chamber 22. Also extending outwardly from the lower region of the conveyor housing 18 are flexible panels 118, 118a, 120, 120a, 122 and 122a which align interfacingly and sealingly in close proximity or having intimate contact with non-flexible panels 96 and 96a, respectively, to comprise, in part, the shroud 27 forming the rotary broom chamber 22. Also extending outwardly from the lower and forward region of the conveyor housing 18 are

transversely mounted flexible slotted panels 124 and 126 which act as a double seal against and to the roadway and which comprise, in part, the shroud 27 forming the rotary broom chamber 22. Transversely mounted flexible panels 128 and 130 at the upper region of the conveyor housing 18 assist flexible side seals 39 and 39a and flexible seal 38 to seal the upper end of the conveyor housing 18 to the receiver duct 36 and the areas adjacent to the receiver duct 36 to ensure a sealed and a flexible coupled connection of the upper region of the conveyor housing 18 to the interior of the hopper 14.

[0037] The conveyor housing 18 aligns transversely and indirectly between the frameworks 21 and 21a and aligns directly between the frameworks 70 and 70a and extends vertically therebetween in angular alignment and can be positioned as required with respect to the vertical and horizontal by the conveyor/conveyor housing mount assemblies 84 and 84a which utilize hydraulics to provide such movement. Other components which can influence the position of the conveyor housing 18 include opposing vertically oriented C-channels 132 and 132a, as also viewed in **FIG. 8**, which secure to the opposing sides of the conveyor housing 18 and include, respectively, opposing solid cylindrical pucks 134 and 134a mounted on the inwardly facing surfaces of fixed brackets 136 and 136a extending downwardly from the frameworks 70 and 70a. The conveyor housing 18 is illustrated in the sweep mode and, as such, the conveyor housing 18 is supported in part by the engagement of the pucks 134 and 134a with the upper curved regions of the C-channels 132 and 132a, thereby lending support at the lower region of the conveyor housing 18. The conveyor/conveyor housing mount assemblies 84 and 84a connect to and in various

modes of operation actively or passively support, in part, the upper region of the conveyor housing 18 and are interconnected, as shown in **FIG. 8**, to offer variable geometry active or passive support of the conveyor housing 18 at the upper region of the conveyor housing 18 during certain modes of operation, as described later in detail. During passive support (sweep mode), the conveyor/conveyor housing mount assemblies 84 and 84a are not influenced by hydraulic forces and offer lateral structural support in part. During passive support involvement by the conveyor/conveyor housing mount assemblies 84 and 84a, such as in the sweep mode, angled supports 165 and 165a on the lower surfaces of configured pivot bars 138 and 138a of the conveyor/conveyor housing mount assemblies 84 and 84a are in intimate supporting contact with vertically aligned support blocks 167 and 167a which mount to the frameworks 70 and 70a to offer lateral support and vertical support of the upper region of the conveyor housing 18.

[0038] The conveyor/conveyor housing mount assemblies 84 and 84a feature major components including geometrically configured pivot bars 138 and 138a, rollered arm assemblies 140 and 140a, arms 142 and 142a, and actuating cylinders 144 and 144a. The conveyor/conveyor housing mount assemblies 84 and 84a are transversely connected by a box tube 146 and a tube 148 and actuated and positioned in part by a hydraulic actuating cylinder 150, all shown in **FIG. 8.** The bottom ends of the pivot bars 138 and 138a engage and can pivot about pivot pins 152 and 152a which are mounted through and extend inwardly from frameworks 70 and 70a. Yoke-like brackets 154 and 154a, being opposing substantially V-shaped members, opposingly attach to the opposing vertically oriented sides of the pivot bars 138 and 138a to serve as

pivotal mounting structures for the rollered arm assemblies 140 and 140a which attach between the opposing V-shaped members of the yoke-like brackets 154 and 154a by pivot pins 156 and 156a. One end of the actuating cylinders 144 and 144a pivotally attach by pivot pins 160 and 160a to brackets 158 and 158a which attach to and extend upwardly from the lower region of the pivot bars 138 and 138a. The other ends of the actuating cylinders 144 and 144a pivotally secure in suitable fashion to the rollered arm assemblies 140 and 140a to hydraulically pivot the rollered arm assemblies 140 and 140a about the pivot pins 156 and 156a. Rollered arm assemblies 140 and 140a include rollers 162 and 162a which can be urged by hydraulic action into contact with the lower edges of the arms 142 and 142a to influence the substantially vertical position of the conveyor housing 18 and contained conveyor mechanism 16 as required. The upper ends of the pivot bars 138 and 138a pivotally attach via bearing assemblies 164 and 164a to the forward ends of the arms 142 and 142a. The rearward ends of the arms 142 and 142a incorporate bearinged mount fixtures 166 and 166a which pivotally secure the arms 142 and 142a to pivot pins 169 and 169a extending from the opposing sides of the conveyor housing 18. Opposing lifting lugs 168 and 168a are secured to the vertical sides of the conveyor housing 18. A hydraulic motor 170 shown on the near side of the conveyor housing 18 powers the conveyor mechanism 16. Other components associated with the conveyor/conveyor housing mount assemblies 84 and 84a are shown in and described in relation to **FIG. 8**.

[0039] **FIG. 8** illustrates an isometric view of the conveyor housing 18 and other components associated therewith. Illustrated in particular is the interconnection of the conveyor/conveyor housing mount assemblies 84 and 84a by the box tube 146 and by the tube 148 extending therebetween. Tube 148 extends between the forward ends of the arms 142 and 142a to provide connective association between the upper regions of the conveyor/conveyor housing mount assemblies 84 and 84a. Brackets 172 and 172a extend forwardly from the pivot bars 138 and 138a to accommodate the box tube 146 which extends therebetween to provide connective association between the lower regions of the conveyor/conveyor housing mount assemblies 84 and 84a. Another bracket 174 is shown distanced from and secures to the mid portion of the box tube 146. One end of the hydraulic actuating cylinder 150 pivotally secures to the bracket 174 and the other end pivotally secures to a bracket 176 which in turn secures to a framework member. Bracket 174 secures to the box tube 146.

MODE OF OPERATION

[0040] The preceding figures have best shown and described the structure of the street sweeper 10 in the sweep mode. Hydraulic operating power is provided by one or more truck mounted hydraulic pumps, filters and coolers and appropriately routed by hydraulic controls (not shown) for operation of hydraulically operated components, such as, but not limited to, the fan 26, the hydraulic drive motor assembly 61, the gutter broom assemblies 65 and 65a, the broom lift/lower cylinders 72, 72a, the drag shoe lift/lower cylinders 78, 78a, the actuating cylinders 144, 144a and 150, and the hydraulic motor 170. During the sweep mode, the deflection mode, the transit mode or the dump mode various components are positioned or operated or are not operated to meet the need of that particular mode of operation, as described in detail herein.

[0041] During the sweep mode, gutter broom assemblies 65 and 65a are powered and utilized to sweep and direct debris to the center of the travel path of the truck 12 and into the path of the forwardly advancing rotary broom 20. The rotary broom 20 sweepingly directs debris forwardly and upwardly to be deposited on the lower receiving end of conveyor mechanism 16 for conveyance to the hopper 14 which is surrounded by the conveyor housing 18. During the sweep mode, the rotary broom 20 is positioned vertically by action of the broom lift/lower cylinders 72 and 72a, bell cranks 74 and 74a, cables 76 and 76a, and pivotal broom support arms 60 and 60a for suitable and appropriate sweeping contact with the roadway. Suitable cable tension can be maintained to limit downward gravitational movement of the rotary broom 20 to control rotary broom force, as desired. The nonflexible panels 98 and 98a attached to the pivotal

broom support arms 60 and 60a correspondingly position along the slots 92 and 92a in the fixed nonflexible panels 90 and 90a and along nonflexible panels 96 and 96a to maintain vacuumized integrity of the rotary broom chamber 22. Drag shoes 62 and 62a are positioned vertically by action of the drag shoe lift/lower cylinders 78 and 78a, bell cranks 80 and 80a, cables 82 and 82a, and pivotal drag shoe support arms 64 and 64a for suitable and appropriate sliding contact with the roadway. Suitable cable tension can be maintained to limit downward gravitational movement of the drag shoes 62 and 62a, as desired. Nonflexible panels 96 and 96a attached to the drag shoes 62 and 62a correspondingly position along the fixed nonflexible panels 90 and 90a and nonflexible panels 98 and 98a to maintain vacuumized integrity of the rotary broom chamber 22. During the sweep mode, the conveyor housing 18 containing the conveyor mechanism 16 is supported, as previously described in relation to **FIGS. 6 and 7**, and by support blocks 167 and 167a and by the pucks 134 and 134a with the assistance of gravitational forces. The conveyor/conveyor housing mount assemblies 84 and 84a offer passive support of the conveyor housing 18 in the sweep mode.

[0042] In the sweep mode the fan 26 is utilized to create a region of low pressure, or vacuum, which communicates through the conveyor housing 18 with the vacuumized chamber 22 surrounding the rotary broom 20 to maintain an area of low pressure or vacuum in the rotary broom chamber 22. Air containing dust particles, as shown by dark arrows (**FIG. 1**), is drawn through the areas of increasingly lower pressures from the vacuumized chamber 22, through the conveyor housing 18, through the hopper 14 and thence into and through the filter 30 and fan 26 for filtration, and then exiting the exhaust port 28 as filtered

clean air, as shown by a light arrow.

[0043] **FIG. 9** illustrates the deflection mode, whereby the lower region of the conveyor housing 18 encounters an obstacle 178 while primarily engaged in the sweep mode. During such an encounter, the conveyor housing 18 can accommodatingly pivot or otherwise reposition to avoid damage to the structure of the invention. Pivoting occurs and centers about the junction of the angled supports 165 and 165a with the support blocks 167 and 167a or, in the alternative, the conveyor housing 18 can be repositioned to a position where intimate engagement of the angled supports 165 and 165a with the support blocks 167 and 167a no longer occurs. At such a time the pucks 134 and 134a disengage from the C-channels 132 and 132a. The conveyor/conveyor housing mount assemblies 84 and 84a offer passive support of the conveyor housing 18 during the deflection mode.

[0044] **FIG. 10** illustrates the transit mode, whereby the conveyor housing 18 is raised to allow high speed transit of the street sweeper 10 along the roadway to a sweeping site. In the transit mode, the upper region of the conveyor housing 18 is actively influenced by the conveyor/conveyor housing mount assemblies 84 and 84a which are instrumental in the elevating of the conveyor housing 18 to a position where the lower region of conveyor 18 is distanced from the roadway. Actuating cylinders 144 and 144a, part of the conveyor/conveyor housing mount assemblies 84 and 84a, are powered and extend to pivotally position the rollered arm assemblies 140 and 140a and thus cause the rollers 162 and 162a to forcibly engage the lower edges of arms 142 and 142a. Such forced engagement pivots the arms 142 and 142a upwardly about the bearing assemblies 164 and 164a to carry and position the conveyor housing 18 in an upward direction. The pivot bars 138 and 138a remain stationary with respect to the conveyor housing 18 and are supported in part by the angled supports 165 and 165a and the support blocks 167 and 167a which remain in intimate contact during the transit mode. As the conveyor housing 18 is first elevatingly influenced by the conveyor/conveyor housing mount assemblies 84 and 84a, the pucks 134 and 134a disengage from the upper portion of the C-channels 132 and 132a and remain disengaged until reaching and contacting the lower region of the C-channels 132 and 132a upon which supportive re-engagement occurs with the lower region of the C-channels 132 and 132a to support and stabilize the lower region of the conveyor housing 18. Repositioning of the conveyor 18 also repositionally disengages the upper region of the conveyor housing 18 from intimate and meaningful contact with the receiver duct 36. After the rollered arm

assemblies 140 and 140a are driven past the over center position by the actuating cylinders 144 and 144a, hydraulic flow is interrupted and pressure is locked in the cylinders, such as by a check valve (not shown) to maintain the conveyor/conveyor housing mount assemblies 84 and 84a, and thus the conveyor mechanism 16 and conveyor housing 18 in the transit mode position. During the transport mode, the rotary broom 20 and the drag shoes 62 and 62a are positioned upwardly by the action of the broom lift/lower cylinders 72 and 72a, and the drag shoe lift/lower cylinders 78 and 78a, respectively, and associated components to prevent unwanted contact with the roadway. The conveyor/conveyor housing mount assemblies 84 and 84a offer active support of the conveyor housing 18 during the transit mode.

[0045] **FIG. 11** illustrates the dump mode, whereby the conveyor housing 18 is raised and positioned rearwardly to accommodate removal of debris and subsequent depositing of the debris to an adjacently positioned truck from an elevated hopper 14. During the dump mode, the conveyor housing 18 is positioned upwardly in the same manner as described in **FIG. 10** by powering of the actuating cylinders 144 and 144a to vertically position the conveyor housing 18. In addition, the conveyor housing 18 is positioned rearwardly by the action of the actuating cylinder 150. The actuating cylinder 150 urges the box tube 146 and the attached conveyor/conveyor housing mount assemblies 84 and 84a rearwardly to reposition the conveyor housing 18 in a like direction. Such action causes rotation of the conveyor housing 18 about the center of the lower region of the C-channels 132 and 132a, which are in supportive engagement with the pucks 134 and 134a, to entirely remove the upper region of the conveyor housing 18 from engagement or other influence with the receiver duct 36 of the hopper 14. Such positioning allows the hopper 14 to be raised by the scissors jack assembly 24 without interference by the conveyor housing 18. The hopper 14 is then tilted or rotated by means common to the art to dump the debris into an adjacent dump truck or other suitable waste receptacle. The conveyor/conveyor housing mount assemblies 84 and 84a offer active support of the conveyor housing 18 during the dump mode.

[0046] Various modifications can be made to the present invention without departing from the apparent scope hereof.

IT IS CLAIMED: